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MEASUREMENTS OF "BARK
RENEWAL" IN HEVEA.

L. E. CAMPBELL, B.Sc., F.I.C.

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MEASUREMENTS OF "BARK RENEWAL" IN HEVEA.

N previous Bulletins the writer has given an account of various experiments which have been made with the object of ascertaining the effects of tapping systems on the physiological processes of the rubber tree. The results of these experiments enabled us to draw certain conclusions as to the probable effects of various types of tapping systems, particularly as regards the rapidity of renewal of tapped cortex.*

It may be admitted that the examination of the cortex and wood of tapped trees for the presence of starch and sugar has only led to general results.

Beyond a certain point, the differences in the types of results obtained are too small to enable us to draw very definite conclusions. It was, therefore, decided to carry out a number of measurements of the thickness of bark of different ages of renewal tapped by various systems, with the object of throwing more light on questions which have already been discussed in connection with the effects of various tapping systems on the starch reserves of the tree. In this, as in most other similar experiments on estate trees, the efficiency of the investigations is impaired by the difficulty of obtaining reliable details as to the individual history of each tree.

The measurements described in the following pages were carried out on trees the history of which was known with some certainty. The measurements were carried out with the Tromp de Haas Bark Measuring Gauge. The limit of accuracy was found to be 1 millimetre. The results have been classified under the following headings :—

- (1) Old mixed tapping.
- (2) One cut on one-quarter of the tree's circumference. Tapped daily.

* Popularly termed "bark," though this expression is a misnomer.

(3) Two cuts on one-quarter of the tree's circumference. Tapped on alternate days. One quarter tapped each year.

(4) One cut on one-third of the tree's circumference. Tapped daily.

(5) One cut on one-half of the tree's circumference. Tapped daily.

(6) One cut on one-half of the tree's circumference. Tapped on alternate days.

(7) One cut on one-half of the tree's circumference. Tapped on alternate days. Tapping transferred to the other side of the tree every six months.

(8) Two V cuts on one-half of the tree's circumference. Tapping transferred to the other side of the tree about every six months.

(1) Old Mixed Tapping.

These measurements were made on old trees which had been tapped by various methods from time to time, the object being to ascertain the type of renewal that may be expected in such cases.

Tree No. 1.

The tree was about sixteen years old at the time of examination. The girth at 3 feet above ground level was 52½ inches.

Tapping was commenced when the tree was eight years old, the method being that of separate incisions, and not paring. After this it was tapped by three cuts, the top one being 54 inches from the ground and the other two 18 inches apart. Though tapped on one-half the tree's circumference, a 2-inch vertical strip was left between the tapped areas. These cuts were changed over to the other side of the tree every six months. This system of tapping was carried out during the fifth and fourth years before examination. After this two of the cuts were discontinued.

“Bark” measurements :—

	Millimetres.
Thickness of untapped bark above tapped area	11
Do. below do.	13
Thickness of renewed bark on top tapped area (5 years)	8.9
Do. middle do. (4 years)	7
Do. bottom do. (2 years)	5
Thickness of renewed bark tapped three years before	6.5

Tree No. 2.

The history of this tree was similar to that of No. 1.

			Inches.
Girth at 3 feet from the ground	..	..	49½
			Millimetres.
Thickness of untapped "bark" above tapped area	..	..	10
Do. below do.	..	..	10
Thickness of renewed "bark" on area tapped 5 years before			7
Do. do.	4	do. ..	6
Do. do.	2-1	do. ..	5

Tree No. 3.

This tree was about twenty-two years old at the time of examination. It had first been tapped up to a height of 20 feet, and subsequently with five cuts up to a height of 5 feet above ground level, since when it had been tapped continuously with a decreasing number of cuts.

The girth at 3 feet from the ground was 47½ inches.

The "bark" was everywhere 5 millimetres thick, excepting where tapped during the last three months. There was no untapped "bark" in the lower part of the trunk.

Tree No. 4.

The history of this tree was similar to that of No. 3.

The girth at 3 feet from the ground was 41 inches. The renewed "bark" at 5 feet above ground level was 6·5 millimetres thick. Lower than this it was 5 millimetres thick, except where tapped during the last three months.

Tree No. 5.

The history of this tree was similar to that of Nos. 3 and 4.

The girth at 3 feet from the ground was 42½ inches.

The thickness of renewed bark at 5 feet from the ground was 6 millimetres. Lower than this it was from 5-6 millimetres. The thickness of untapped bark at the base of the tree was 10 millimetres.

"Bark" of five years' renewal on tree No. 1 was 83 per cent. of the thickness of neighbouring untapped bark. Bark

of two years' renewal was 54 per cent. of the thickness of untapped bark.*

Very similar figures were given by tree No. 2, except that the bark which had been renewing for five years was only 70 per cent. of the thickness of the untapped bark. The corresponding figure for bark of from one to two years' renewal was 50 per cent.

The measurements taken on trees Nos. 3, 4, and 5 should give us some indications of what type of bark renewal may be expected of old severely-tapped trees. All the lower parts of the trunk had been tapped, and the renewing bark was from 5 to 6 millimetres thick.

In one case some untapped bark was available, and was found to be 10 millimetres thick.

Tapping on Quarters.

(2) One Cut on One-quarter of the Tree's Circumference.

Tapped Daily.

This tree was typical of a number measured in the same field. The age of the trees at the time of examination was eight years, and they had been tapped for one year.

Tree No. 6.

	Inches.
Girth of the tree at 3 feet from the ground	.. 29
	Millimetres.
Thickness of untapped bark above tapped area	.. 6.5
Do. below do.	.. 7
Thickness of bark 2 inches from top of tapped area	.. 3
Do. 4 do.	.. 2.5
Do. 6 do.	.. 2
Do. 8 do.	.. 2
Do. 10 do.	.. 2
Do. 12 do.	.. 2
Do. 14 do.	.. 2
Do. 16 do.	.. 1

* This figure does not correctly express "percentage of complete renewal," because the "bark" is not completely pared down to the cambium. It is, however, a convenient approximation by which we can compare different renewals.

The renewing bark of the tapped area was of a practically uniform thickness all the way down, and no very active renewal had taken place.

**(3) Two Cuts on One-quarter of the Tree's Circumference.
Tapped on Alternate Days. One-quarter tapped
each Year.**

On nearly all these trees three of the quarters had been tapped, the fourth quarter being nearly completed at the time of examination.

Tree No. 7.

Girth at 3 feet from the ground		Inches.
..		.. 32
		Millimetres.
Average thickness of untapped bark in neighbourhood of tapped areas		.. .. 8.5
Average thickness of renewing bark on quarter tapped		
3 years previously		.. 8
Do.	2 do.	.. 7
Do.	1 do.	.. 7
Do.	in tapping	.. 4

Tree No. 8.

The history of this tree was similar to that of No. 7, except that one-quarter had not yet been tapped.

Girth at 3 feet from the ground		Inches.
..		.. 36
		Millimetres.
Average thickness of untapped bark in neighbourhood of tapped area		.. .. 10
Average thickness of renewing bark on quarter tapped		
2 years previously		.. 9.5
Do.	1 do.	.. 8
Do.	in tapping	.. 2.2

Tree No. 9.

The history of this tree was similar to that of No. 7.

Girth at 3 feet from the ground		Inches.
..		.. 43½
		Millimetres.
Average thickness of untapped bark in neighbourhood of tapped area		.. .. 7
Average thickness of renewing bark on quarter tapped		
3 years previously		.. 5.5
Do.	2 do.	.. 5.5
Do.	1 do.	.. 4
Do.	in tapping	.. 2.2

Tree No. 10.

The history of this tree was similar to that of Nos. 7 and 9.

		Inches.
Girth at 3 feet from the ground	..	39½
		Millimetres.
Average thickness of untapped bark in neighbourhood of tapped area	..	9
Average thickness of renewing bark on quarter tapped	3 years previously	7
Do.	2 do.	6.5
Do.	1 do.	5.5
Do.	in tapping	2

Tree No. 11.

The history of this tree was similar to that of Nos. 7, 9, and 10.

		Inches.
Girth at 3 feet from the ground	..	35½
		Millimetres.
Average thickness of bark in neighbourhood of tapped area	..	8
Average thickness of renewed bark on quarter tapped	3 years previously	7
Do.	2 do.	7
Do.	1 do.	5.5
Do.	in tapping	2

Tree No. 12.

The history of this tree was similar to that of No. 8.

		Inches.
Girth at 3 feet from the ground	..	46
		Millimetres.
Average thickness of untapped bark in neighbourhood of tapped area	..	8
Average thickness of renewed bark on quarter tapped	2 years previously	6
Do.	1 do.	6.5
Do.	in tapping	3

The ratios of the averages of the thicknesses of Renewed Bark : Untapped Bark for the various quarters are as follows :—

		Renewed Bark : Untapped Bark. Per Cent.
Quarter tapped 3 years previously	..	86.2
Do. 2 do.	..	84.1
Do. 1 do.	..	67.8
In tapping	..	31.3

A point of interest that arises here is the question of the relative ratios of renewal of bark on the various quarters. The average of the thickness of the renewing bark on the quarter last tapped at 1 inch from the top of the tapped area was only 3.07 millimetres, of which at least 1 millimetre was bark left untapped by the cooly. This last quarter had been commenced nearly a year before the measurements were taken. Therefore, in not less than nine months only about 2 millimetres had been added to the thickness of the bark by renewal.

On the other hand, the previous quarter was being finished one year before the measurements were taken. The average thickness of the bark at the bottom of the quarter which had been tapped one year previously was 5.5 millimetres, which would correspond to about 4.5 millimetres of renewal. That is to say, that, although there was not more than three months' difference between the times these two portions of bark were tapped, the bark on the previously tapped quarter had renewed more than twice as much as the bark on the quarter in tapping. This would appear to indicate that the bark at the bottom of the quarter tapped previously renewed more rapidly than the bark at the top of the quarter in tapping.

Other general results are that 86 per cent. of the thickness of the untapped bark was attained in from three to four years and 84.1 per cent. in from two to three years, a result which cannot be regarded as other than very satisfactory.

The slow increase after three years is very apparent. In very few cases is renewed bark found to be as thick as corresponding untapped bark. The best renewals are usually about 1 millimetre less in thickness.

It was thought that there might possibly be some difference between the rates of renewal of the top and bottom cuts. With the object of ascertaining whether this was the case, the average thicknesses of the bark halfway down each of the two cuts in tapping were ascertained. The ratio of Renewed Bark : Untapped Bark was 37.8 per cent. for the top cut and 31.6 per cent. for the bottom cut. Whilst there is a difference of 6.2 per cent. in favour of the top cut, the figure is hardly large enough to justify us in drawing a definite conclusion from the difference.

Tapping on Thirds.**(4) One Cut on One-Third of the Tree's Circumference.
Tapped Daily.***Tree No. 13.*

Tapping on previously untapped bark.

		Inches
Girth of tree at 3 feet from the ground	..	33½
		Millimetres
Thickness of untapped bark in neighbourhood of tapped area	..	9
Thickness of renewing bark at 2 inches from the top of the tapped area	..	3
Do.	4	do. 3
Do.	6	do. 2½
Do.	8	do. 2
Do.	10	do. 2

Tree No. 14.

Tapping on previously untapped bark.

		Inches
Girth at 3 feet from the ground	..	33
		Millimetres
Average thickness of untapped bark in the neighbourhood of the tapped area	..	8·3
Thickness of renewing bark 2 inches from the top of the tapped area	..	3·5
Do.	4	do. 2·5
Do.	6	do. 3
Do.	8	do. 3
Do.	10	do. 3
Do.	12	do. 3
Do.	14	do. 2·5
Do.	16	do. 2
Do.	12	do. 5
Do.	14	do. 4·5
Do.	16	do. 4·5
Do.	18	do. 4·5
Do.	20	do. 4
Do.	22	do. 3·5
Do.	24	do. 3·5
Do.	26	do. 3
Do.	28	do. 3
Do.	30	do. 3
Do.	32	do. 3

Tree No. 17.

Tapping on previously untapped bark. The portion of the tree on which the measurements were taken had not been tapped during the eighteen months preceding examination. The tapping of this area was carried out during the second and third years before the tree was examined.

		Inches.
Girth of the tree at 3 feet from the ground		.. 37½
		Millimetres.
Thickness of the untapped bark in the neighbourhood of the tapped area		.. 7·5
Thickness of the bark at 2 inches below the top of the tapped area		.. 5
Do.	4	do. .. 4
Do.	6	do. .. 4
Do.	8	do. .. 3·5
Do.	10	do. .. 4
Do.	12	do. .. 4
Do.	14	do. .. 4
Do.	16	do. .. 4
Do.	18	do. .. 4
Do.	20	do. .. 4
Do.	22	do. .. 3·5
Do.	24	do. .. 3
Do.	26	do. .. 3
Do.	28	do. .. 3
Do.	30	do. .. 2

On the other side of the tree the untapped bark was 7·5 millimetres thick.

The bark tapped three years before was 4 millimetres thick, and that tapped one year before 3 millimetres thick.

Tree No. 15.

Tapping on bark previously pricked with Northway pricker.

		Inches.
Girth at 3 feet from the ground		.. 37½
		Millimetres.
Thickness of bark in neighbourhood of the tapped area		.. 8
Thickness of renewing bark at 2 inches from the top of the tapped area		.. 3·5
Do.	4	do. .. 3
Do.	6	do. .. 3
Do.	8	do. .. 3

			Millimetres.
Thickness of renewing bark at 10 inches from the top of the			
		tapped area ..	3
Do.	12	do. ..	3
Do.	14	do. ..	3
Do.	16	do. ..	3
Do.	18	do. ..	2
Do.	20	do. ..	2
Do.	22	do. ..	2

On the other side of the tree bark which had been tapped three years previously was 4 millimetres thick.

Tree No. 16.

Tapping on bark which had previously not been tapped or had been pricked only.

			Inches
Girth at 3 feet from the ground ..			49
			Millimetres.
Thickness of bark in the neighbourhood of the tapped area			3.5
Thickness of renewing bark at 2 inches from the top of the			
		tapped area ..	6
Do.	4	do. ..	5.5
Do.	6	do. ..	5
Do.	8	do. ..	5
Do.	10	do. ..	5

Tree No. 18.

Tapping on renewed bark. Age of tree, eleven years. Two tapping areas were measured.

The first area had been tapped during the second and third years prior to examination.

Thickness of renewed bark which was being re-tapped, 6 millimetres.

Vertical length of tapped surface, 28 inches.

The thickness of the second renewal, taken eighteen months after the tapping had ceased, was everywhere 3 millimetres. That is to say, there was a vertical strip of bark 28 inches long, with a uniform thickness of 3 millimetres.

The other area was being tapped at the time of examination.
Measurements were as follows :—

				Millimetres.
Thickness of bark 2 inches below top of tapped area				.. 3
Do.	4	do.	..	.. 3
Do.	6	do.	..	.. 2
Do.	8	do.	..	.. 1.5
Do.	10	do.	..	.. 1
Do.	12	do.	..	.. 1

Tree No. 19.

Tapping on renewed bark.

				Inches.
Girth of the tree at 3 feet from the ground				.. 37½
				Millimetres.
Thickness of renewed bark undergoing re-tapping				.. 6
Thickness of the bark 2 inches below top of the new tapping				.. 2
		area	..	.. 2
Do.	4	do.	..	.. 2
Do.	6	do.	..	.. 2
Do.	8	do.	..	.. 1.5
Do.	10	do.	..	.. 1

Tree No. 20.

Tapping on renewed bark. Tapping was in progress at the time of examination.

				Inches.
Girth of tree at 3 feet from the ground ..				.. 41½
				Millimetres.
Thickness of untapped bark ..				.. 10
Thickness of renewed bark undergoing re-tapping				.. 5-6.5
Thickness of bark 2 inches below the top of the new tapping				.. 3
		area	..	.. 3
Do.	4	do.	..	.. 2.5
Do.	6	do.	..	.. 2.5
Do.	8	do.	..	.. 2.5
Do.	10	do.	..	.. 2.5
Do.	12	do.	..	.. 2.0
Do.	14	do.	..	.. 1.5

Tree No. 21.

Tapping on renewed bark.

		Inches.
Girth of the tree at 3 feet from the ground		.. 34½

			Millimetres.
Thickness of renewed bark undergoing re-tapping	..		6.5
Thickness of bark 2 inches below the top of the tapped area	..		3.5
Do. 4	do.	..	2.5
Do. 6	do.	..	2
Do. 8	do.	..	2
Do. 10	do.	..	1.5
Do. 12	do.	..	1.5
Do. 14	do.	..	1.5

Tree No. 22.

Tapping on renewed bark.

	Inches.
Girth of the tree at 3 feet from the ground	.. 36½

			Millimetres.
Thickness of the renewed bark undergoing re-tapping	..		5
Thickness of the renewed bark 2 inches below top of tapped area	..		1.5
Do. 4	do.	..	1.5
Do. 6	do.	..	1.5
Do. 8	do.	..	1.5
Do. 10	do.	..	1.5
Do. 12	do.	..	1.5
Do. 14	do.	..	1.5
Do. 16	do.	..	1.5

Tree No. 23.

Tapping on renewed bark.

	Inches.
Girth of tree at 3 feet above ground	.. 49½

			Millimetres.
Thickness of untapped bark	..		9.5
Thickness of renewed bark undergoing re-tapping	..		7
Thickness of bark 2 inches below top of tapped area	..		4
Do. 4	do.	..	4
Do. 6	do.	..	3
Do. 8	do.	..	3
Do. 10	do.	..	3
Do. 12	do.	..	3
Do. 14	do.	..	3
Do. 16	do.	..	3

The thickness of bark on the other side of the tree, tapped four years before, was 6 millimetres.

In the case of tree No. 14 the renewing bark after three years was only 53.3 per cent. of the thickness of untapped bark, as

against 84.1 per cent. in the case of trees Nos. 7-12, which were tapped by two cuts on one-quarter on alternate days.

In the case of tree No. 15 the percentage renewal was 50 per cent. In the case of tree No. 18 the percentage of renewal on re-tapping renewed bark 6 millimetres thick was 50 per cent. after three years, thus leaving a vertical strip of bark 2 feet in length and only 3 millimetres, or about $\frac{1}{8}$ th inch, thick.

Only in the case of tree No. 23 was a satisfactory renewal observed, the percentage renewal being 85.7 per cent. after four years.

In the case of tree No. 22 a vertical strip of bark 16 inches long was only 1.5 millimetres thick, or about $\frac{1}{16}$ th inch. As 1.5 millimetres is the thickness of bark that should always be left untapped on the cambium, it would appear that during the previous eighteen months or two years no renewal had been taking place.

On the whole, therefore, the bark renewal of trees Nos. 13-23 was exceedingly poor.

It must be recorded here that the trees examined were growing on various estates in the Western Province of Ceylon, and that the actual handiwork of the tappers was good, as judged by freedom from wounds.

The probable causes of the poor bark renewal will be discussed later.

(5) One Cut on One-half of the Tree's Circumference.
Tapped Daily, and on only one side of the Tree.

Tree No. 24.

This tree was eight years old at the time of examination, and had been tapped for two years.

		Inches.
Girth at 3 feet above ground level	..	.. 30 $\frac{1}{2}$
		Millimetres.
Thickness of untapped bark	..	.. 7.5
Thickness of renewing bark 2 inches from top of tapped area		5.5
Do. 4	do.	.. 4.5
Do. 6	do.	.. 4
Do. 8	do.	.. 4
Do. 10	do.	.. 4

			Millimetres.
Thickness of renewing bark 12 inches from top of tapped area			3
Do.	14	do.	3
Do.	16	do.	2
Do.	18	do.	2
Do.	20	do.	1

Tree No. 25.

The history of this tree was similar to that of No. 24.

			Inches.
Girth at 3 feet above ground level	..	..	30½
			Millimetres.
Thickness of untapped bark	..	..	6.5
Thickness of renewing bark 2 inches below top of tapped area			4
Do.	4	do.	4
Do.	6	do.	3
Do.	8	do.	3
Do.	10	do.	2.5
Do.	12	do.	1.5
Do.	14	do.	1.5
Do.	16	do.	1
Do.	18	do.	1
Do.	20	do.	1

Tree No. 26.

The history of this tree was similar to that of Nos. 24 and 25.

			Inches.
Girth at 3 feet above ground level	..	..	29½
			Millimetres.
Thickness of untapped bark	..	..	7.5
Thickness of renewing bark 2 inches from top of tapped area			5
Do.	4	do.	5
Do.	6	do.	4
Do.	8	do.	3.5
Do.	10	do.	3.5
Do.	12	do.	4
Do.	14	do.	3.5
Do.	16	do.	2
Do.	18	do.	2
Do.	20	do.	1.5

The average of the renewal of the bark of trees Nos. 24-26 for two years was 67 per cent., and after one year 46 per cent.

The length of time of renewal was perhaps too short for us to judge equitably the renewal.

The third year might indeed have added another millimetre to the thickness of the renewing bark.

It must be noted that the bark of the lower 8 inches of the pared area of tree No. 25 was nowhere thicker than 1·5 millimetres.

(6) One Cut on One-half the Tree's Circumference.
Tapped on Alternate Days.

Tree No. 27.

This tree had been tapped on one side for two years, the breadth of the strip of bark removed being $15\frac{1}{2}$ inches measured vertically.

Girth at 3 feet above ground level		..	Inches. .. 29½
			Millimetres
Thickness of untapped bark		..	.. 8
Thickness of renewing bark 2 inches from top of tapped surface		..	.. 5
Do.	4	do.	.. 5
Do.	6	do.	.. 4
Do.	8	do.	.. 3·5
Do.	10	do.	.. 3
Do.	12	do.	.. 3
Do.	14	do.	.. 3*

* Tapped about nine months before measurement.

Tree No. 28.

This tree was tapped two years on one side only, the breadth of the strip of bark removed being 14 inches measured vertically.

Girth at 3 feet above ground level		..	Inches. .. 30 *
			Millimetres.
Thickness of untapped bark		..	.. 8
Thickness of renewing bark 2 inches from top of tapped area		..	.. 6
Do.	4	do.	.. 5
Do.	6	do.	.. 5
Do.	8	do.	.. 5
Do.	10	do.	.. 5
Do.	12	do.	.. 5
Do.	14	do.	.. 4·5*

* Tapped one year before examination.

Tree No. 29.

This tree had been tapped on one side from three years until eight months before examination, the tapping being carried out on previously untapped bark.

		Inches.
Girth at 3 feet above ground level	..	.. 32
		Millimetres.
Thickness of untapped bark	..	.. 8
Thickness of renewing bark 2 inches below top of tapped area		6
Do.	4	do. .. 4.5
Do.	6	do. .. 4
Do.	8	do. .. 4
Do.	10	do. .. 4
Do.	12	do. .. 3
Do.	14	do. .. 3
Do.	16	do. .. 3
Do.	18	do. .. 2

Tree No. 30.

One side of the tree had been tapped from three years until the time of examination.

		Inches.
Girth at 3 feet above ground level	..	.. 30
		Millimetres.
Thickness of untapped bark	..	.. 8.5
Thickness of renewing bark 2 inches from top of tapped area		4
Do.	4	do. .. 4.5
Do.	6	do. .. 5
Do.	8	do. .. 5
Do.	10	do. .. 4.5
Do.	12	do. .. 3
Do.	14	do. .. 1

The renewal of the bark of trees Nos. 27, 28, 29, and 30 after about two and a half years was about 60 per cent. This bark renewal was therefore somewhat poor, as compared with trees Nos. 7-12, but in this case the tree had two and a half years for renewal, as against three years.

(7) **One Cut on One-half of the Tree's Circumference.**
Tapped on Alternate Days. Tapping transferred to
the other side of the Tree every Six Months.

Tree No. 31.

		Inches.
Girth at 3 feet above ground level	..	.. 32½

			Millimetres.
Thickness of untapped bark	..	..	7.5
Thickness of renewing bark tapped 3 years previously	..	..	6.0
Do.	2	do.	5.5
Do.	1	do.	4

Similar measurements were taken on the other side of the tree.

			Millimetres.
Thickness of untapped bark	..	..	9
Thickness of bark tapped 3 years previously	..	..	7.5
Do.	2	do.	5
Do.	1	do.	4

Tree No. 32.

			Inches.
Girth at 3 feet above ground level	..	..	34
			Millimetres.
Thickness of untapped bark	..	..	8
Thickness of renewing bark tapped 3 years previously	..	..	7
Do.	2	do.	5
Do.	1	do.	5

Tree No. 33.

			Inches.
Girth at 3 feet above ground level	..	..	33½
			Millimetres.
Thickness of untapped bark	..	..	9
Thickness of bark tapped 3 years previously	..	..	6
Do.	2	do.	5
Do.	½	do.	3

On the other side of the tree the thickness of the untapped bark was 8 millimetres, that of renewing bark tapped two years previously 5 millimetres, and that of bark tapped one year previously 4 millimetres.

Tree No. 34.

			Inches.
Girth at 3 feet above ground level	..	..	28
			Millimetres.
Thickness of untapped bark	..	..	7.5
Thickness of renewing bark 2 inches from top of tapped area	..	..	5
Do.	4	do.	5
Do.	6	do.	5

			Millimetres.
Thickness of renewing bark 8 inches from top of tapped area			6
Do.	10	do.	5
Do.	12	do.	4.5
Do.	14	do.	4
Do.	16	do.	3

Tree No. 35.

			Inches.
Girth at 3 feet above ground level	..	..	35
			Millimetres.
Thickness of untapped bark	..	..	11
Thickness of renewing bark 2 inches from top of tapped area			8
Do.	4	do.	9
Do.	6	do.	9
Do.	8	do.	9
Do.	10	do.	8.5
Do.	12	do.	8.5
Do.	14	do.	8
Do.	16	do.	8
Do.	18	do.	10

This tapping had been carried out during the second, third, and fourth years before examination.

Trees Nos. 36-40.

These trees were ten years old at the time of examination, and were tapped first when six years old with two cuts. After being so tapped for six months one of the cuts was discontinued, the system subsequently adopted being one cut over half the tree's circumference, changed over to the other side of the tree every six months.

Tree No. 36.

			Inches.
Girth at 3 feet above ground level	..	..	36½
			Millimetres.
Thickness of untapped bark	..	..	8
Thickness of renewed bark undergoing re-tapping		..	7
Thickness of renewed bark tapped 2½ years before		..	6
Do.	6 months	..	5

Tree No. 37.

			Inches.
Girth at 3 feet above ground level	..	..	44½

	Millimetres.
Thickness of untapped bark ..	9
Thickness of renewed bark undergoing re-tapping ..	7.5
Thickness of renewing bark tapped 2½ years before ..	7
Do. 6 months ..	5

Tree No. 38.

Girth at 3 feet above ground level ..	Inches. 32½
Thickness of untapped bark ..	Millimetres. 8
Thickness of renewing bark tapped 2½ years before ..	6
Do. 6 months ..	5½

Tree No. 39.

Girth at 3 feet above ground level ..	Inches. 37½
Thickness of untapped bark ..	Millimetres. 9
Thickness of bark tapped 3 years previously ..	7
Do. 6 months ..	5

The thickness of the renewing bark on the other side of the tree tapped from three years to six months previously was from 9-7.5 millimetres.

Tree No. 40.

Girth at 3 feet above ground level ..	Inches. 46½
Thickness of untapped bark ..	Millimetres. 9.5
Thickness of bark tapped 3 years before ..	7
Do. 6 months ..	4

Tree No. 41.

Girth at 3 feet above ground level ..	Inches. 34
Thickness of untapped bark ..	Millimetres. 9.5
Thickness of renewing bark 2 inches from top of tapped area ..	8
Do. 4 do. ..	7
Do. 6 do. ..	7

				Millimetres.
Thickness of renewing bark 8 inches from top of tapped area				7
Do.	10	do.	..	6
Do.	12	do.	..	6
Do.	14	do.	..	5.5
Do.	16	do.	..	5
Do.	18	do.	..	5
Do.	20	do.	..	5
Do.	22	do.	..	5

Tree No. 42.

				Inches.
Girth at 3 feet above ground level				.. 28
				Millimetres.
Thickness of untapped bark				.. 7.5
Thickness of bark 2 inches below top of tapped area				.. 5
Do.	4	do.	..	5
Do.	6	do.	..	5
Do.	8	do.	..	6
Do.	10	do.	..	5
Do.	12	do.	..	4.5
Do.	14	do.	..	4
Do.	16	do.	..	3

Tree No. 43.

				Inches.
Girth at 3 feet above ground level				.. 35
				Millimetres.
Thickness of untapped bark				.. 11
Thickness of renewing bark 2 inches from top of tapped area				8
Do.	4	do.	..	9
Do.	6	do.	..	9
Do.	8	do.	..	9
Do.	10	do.	..	8.5
Do.	12	do.	..	8.5
Do.	14	do.	..	8
Do.	16	do.	..	8
Do.	18	do.	..	10*

* Tapped two years prior to examination.

Tree No. 44.

				Inches.
Girth at 3 feet above ground level				.. 29½
				Millimetres.
Thickness of untapped bark				.. 8
Thickness of renewing bark tapped 3 years previously				.. 6
Do.	2	do.	..	5.5
Do.	1	do.	..	4

Trees Nos. 31-33 showed an average renewal of 79 per cent. of the thickness of original bark in two years, and 48 per cent. in from six months to one year.

Tree No. 34 showed a renewal of 67 per cent. at the top of the tapped area 16 inches long, and 40 per cent. at the bottom.

Tree No. 35 showed a renewal of 82 per cent. for bark tapped four years before, and 73 per cent. for bark tapped two years before.

Trees Nos. 36 and 37 were examples of re-tapped bark. In two and a half years renewing bark was 83 per cent. of the thickness of the renewed bark, which was being tapped over again. In six months the renewal was 69 per cent. In the cases of Nos. 38 and 39 the tapping was carried out on original bark.

Tree No. 38 showed a renewal of 75 per cent. after two and a half years and 69 per cent. after six months.

Trees Nos. 39 and 40 showed a renewal of 76 per cent. after three years and 49 per cent. after six months.

Tree No. 43 showed a renewal of 73 per cent. after both two and four years.

Tree No. 44 showed a renewal of 75 per cent. in three years and 50 per cent. in one year.

(8) Two V Cuts on One-half of the Tree's Circumference.

Tapping transferred to the other side of the Tree
about every Six Months.

Trees Nos. 47-52 were planted twelve years before examination. They were tapped first with five cuts, which number was gradually decreased year by year until reduced to two cuts two years before the examination was made.

A large number of measurements was made on each tree, but only the more important figures are given here.

Tree No. 45.

	Inches.
Birth at 3 feet above ground level ..	31

			Millimetres
Thickness of untapped bark	..	..	8
Thickness of renewing bark tapped 3 years previously	..	..	7
Do.	2	do.	5
Do.	1	do.	5

Tree No. 46.

			Inches
Girth at 3 feet above ground level	..	..	33
			Millimetres
Thickness of untapped bark	..	..	8
Thickness of renewing bark tapped 3 years previously	..	..	6
Do.	2	do.	5
Do.	1	do.	3

Tree No. 47.

			Inches
Girth at 3 feet above ground level	..	..	36½
			Millimetres
Thickness of untapped bark	..	..	7·5
Thickness of renewing bark tapped 5 years previously	..	..	6·5
Do.	1	do.	6·5
Do.	½	do.	3

Tree No. 48.

			Inches
Girth at 3 feet above ground level	..	..	35
			Millimetres
Thickness of untapped bark	..	..	7·5
Thickness of renewing bark tapped 5 years previously	..	..	6·5
Do.	1	do.	6
Do.	½	do.	4·5

Tree No. 49.

			Inches
Girth at 3 feet above ground level	..	..	35½
			Millimetres
Thickness of untapped bark	..	..	8
Thickness of renewing bark tapped 5 years previously	..	..	7
Do.	1	do.	8
Do.	½	do.	3

Tree No. 50.

			Inches
Girth at 3 feet above ground level	..	..	24½

		Millimetres.
Thickness of untapped bark	..	7.5
Thickness of renewing bark tapped 5 years previously	..	5.5
Do.	1	do. 4
Do.	$\frac{1}{2}$	do. 3

Tree No. 51.

Girth at 3 feet above ground level	..	Inches.	33 $\frac{1}{2}$
Thickness of untapped bark	..	Millimetres.	5
Thickness of renewing bark tapped 5 years before	..	4.5	
Do.	1	do.	3.5
Do.	$\frac{1}{2}$	do.	3

Tree No. 52.

Girth at 3 feet above ground level	..	Inches.	28 $\frac{1}{2}$
Thickness of untapped bark	..	Millimetres.	7
Thickness of renewing bark tapped 5 years previously	..	6	
Do.	1	do.	5
Do.	$\frac{1}{2}$	do.	3

The averages of the renewals of trees Nos. 47-52 were as follows :—After five years the renewing bark was 85 per cent. of the thickness of untapped bark ; after one year it was 77 per cent. of that thickness.

Trees Nos. 45 and 46 showed an average of 79 per cent. renewal after three years and 48 per cent. after one year.

Conclusions.

The measurements show that the trees tapped daily throughout the year resulted in a poor bark renewal, as compared with trees tapped on alternate days and every third day.

Of the trees examined, good first renewals were shown by those tapped by two cuts on one-quarter, one cut sloping upwards to the left on one-half, and two V cuts on one-half. In the first case one-quarter was tapped each year, in the second and third cases tapping was transferred to the other side of the tree about every six months.

In the case of first tapping, if the renewal bark is 85 per cent. of the thickness of the untapped bark within three years of tapping, the renewal may be considered to be good.

After first tapping the renewed bark in only very exceptional cases becomes as thick as the corresponding untapped bark, there usually being a difference in thickness of about one millimetre.

In the case of the tapping on quarters, an area renewed most rapidly during the year following discontinuance of tapping on that quarter.

The bark of some old trees which had been severely tapped appeared to have an almost uniform thickness of about 5 millimetres, about 50 per cent. of the thickness of untapped bark.

L. E. CAMPBELL.

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